We claim:

1. A method of uplinking a digital signal to an earth orbiting satellite so as to facilitate reception of the signal by receivers using small antennas providing wide angle coverage, comprising the steps of:

   a. encoding the digital signal to provide reliable transmission through a noisy RF link;
   b. modulating the encoded digital signal for uplink to a satellite; and
   c. adding synchronization information to the digital signal uplinked to the satellite to facilitate detection and recovery of the transmitted signal by a receiver.

2. A method as claimed in claim 1, further comprising the step of spreading the encoded signal over a wide frequency band prior to uplinking to avoid interference with other authorized users in the band.

3. A method as claimed in claim 1, further comprising the step of compressing the digital signal to minimize transmitted information by removing redundant or less significant information.

4. A method as claimed in claim 1, wherein a baseband signal is analog, and further comprising the step of digitizing the signal by sampling the signal in the time or frequency domain, and quantizing the values.

5. A method as claimed in claim 4, wherein Pulse Code Modulation (PCM) is used to digitize the signal.

6. A method as claimed in claim 4, wherein the baseband signal is audio, and wherein the step of compressing

the digital signal comprises compressing the digital signal by a perceptual audio coding technique to remove sounds inaudible to the human ear.

7. A method as claimed in claim 6, wherein the step of compressing the digital signal further employs the process of Advanced Audio Coding (AAC) as used in MPEG-4.

8. A method as claimed in claim 1, wherein step a. comprises the step of encoding the digital signal by means of a Block or a Convolutional Code.

9. A method as claimed in claim 1, wherein step a. includes the step of interleaving the data to minimize burst errors.

10. A method as claimed in claim 1, wherein step a. comprises the step of Turbo Coding the digital signal.

11. A method as claimed in claim 10, wherein the step of encoding the digital signal is further by means of a Recursive Systematic Convolutional Turbo Code.

12. A method as claimed in claim 1, wherein step a. comprises the step of encoding the digital signal using a relatively long constraint length.

13. A method as claimed in claim 1, further comprising the step of spreading the coded digital signal over a large frequency range by Direct Sequence Spread Spectrum Code Division Multiple Access (DSSS CDMA).

14. A method as claimed in claim 1, wherein step b. further comprises the step of modulating the digital signal by phase shift keying.

15. A method as claimed in claim 1, wherein step c. further comprises the step of adding a synchronization channel to the digital signal uplinked to the satellite to facilitate receiver signal synchronization.

16. A method as claimed in claim 1, wherein step c. further comprises the step of adding a narrow-band pilot tone to the digital signal uplinked to the satellite to facilitate receiver signal synchronization.

17. A method as claimed in claim 1, wherein step c. further comprises the step of adding a clock signal using CW modulation of the digital signal uplinked to the satellite to facilitate receiver signal synchronization.

18. A method as claimed in claim 1, further comprising the step of redundantly broadcasting the uplinked digital signal over two channels, one with a time delay, or from two satellites to mitigate dropouts.

19. A method as claimed in claim 1, further comprising the step of spreading the coded digital signal over a large frequency range by COFDM.

20. A method as claimed in claim 1, wherein the satellite is a C-band satellite.

21. A method as claimed in claim 1, further comprising the step of including identification of geographical areas affect by emergency warning or public service announcements in the uplinked digital signal.

22. A method of processing a digital signal received from an earth orbiting satellite so as to facilitate reception of the signal by small antennas providing wide angle coverage, comprising the steps of:
    a. isolating and passing the received digital signal through a low noise amplifier;
    b. recovering sync signals in the isolated digital signal;
    c. demodulating the isolated digital signal;
    d. despreading the demodulated signal; and
    e. decoding the demodulated signal to correct noise errors introduced during transmission.

23. A method as claimed in claim 22 wherein the signal is further decompressed if it has been compressed and decompression is appropriate for the application.

24. A method as claimed in claim 22, wherein step b. comprises the steps of demodulating a CW clock and using active carrier tracking to recover the sync signals.

25. A method as claimed in claim 22, wherein step e. comprises the step of soft decision sequential decoding using a BCJR algorithm with a maximum a posteriori decoder, or with two maximum a posteriori decoder operating cooperatively.

26. A receiver for use in receiving satellite broadcasts, comprising:

a small antenna providing nearly hemispherical coverage;

a low noise amplifier connected to amplify a signal received by the antenna;

a sync detection and demodulation unit connected to recover timing signals from an amplified signal output by the low noise amplifier;

a plurality of receiver channel processors connected to the low noise amplifier and the sync detection and demodulation unit, each channel processor including a spread spectrum decoder, a demodulator, and an error correction decoder, for recovering baseband signals.

27. A receiver as claimed in claim 26, wherein said satellite broadcasts are C-band satellite broadcasts.

28. A receiver as claimed in claim 26, capable of receiving and processing redundant signals that are time-delayed signals or signals broadcast by different satellites.

29. A receiver as claimed in claim 26, wherein said antenna is a phased array antenna.

30. A receiver as claimed in claim 29, wherein said antenna is a conformal retrodirective phased array antenna.

31. A receiver as claimed in claim 29, wherein the antenna is a square flat flexible panel.

32. A receiver as claimed in claim 29, wherein each element in the phased array is a crossed dipole.

33. A receiver as claimed in claim 26, wherein said amplifier includes a Field Effect Transistor.

34. A receiver as claimed in claim 33, wherein said amplifier includes a High Mobility Electron Field Effect Transistor for at least one element of said antenna.

35. A receiver as claimed in claim 34, wherein said amplifier includes an Indium Gallium Arsenide High Mobility Electron Field Effect Transistor.

36. A receiver as claimed in claim 26, wherein said sync detection and demodulation unit includes an active carrier tracking processor.

37. A receiver as claimed in claim 36, wherein said sync detection and demodulation unit further includes a sync processor for detecting and demodulating a CW clock tone to generate a sync pulse.

38. A receiver as claimed in claim 36, wherein one said sync processor processes a sync signal for a primary transponder, and a second said sync processor processes a sync signal for an unsynchronized second transponder on the same or another satellite.

39. A receiver as claimed in claim 26, wherein the spread spectrum decoder is a Direct Sequence Spread Spectrum Code Division Multiple Access decoder.

40. A receiver as claimed in claim 26, wherein the error correction decoder includes a Maximum A Posterori decoder, or two Maximum A Posterori decoders operating cooperatively.

41. A receiver as claimed in claim 40, wherein the error correction decoder or decoders are arranged to use a BCJR algorithm.

42. A receiver as claimed in claim 26, wherein a number of said channel processors is equal to a number of channels being received at any one time.

43. A receiver as claimed in claim 26, wherein a first said receiver channel processor is used for a first primary data channel, a second said receiver channel processor is used for a second primary data channel, and a third said receiver channel processor is used for one of a time-delayed redundant signal and a signal received from a second satellite.

44. A receiver as claimed in claim 26, wherein at least one additional said receiver channel processor is used to process emergency or public service information.

45. A receiver as claimed in claim 26, further comprising a channel expander for decompressing the baseband signal.

46. A receiver as claimed in claim 26, further comprises a channel assembler for assembling data packets output by the combiner if the satellite broadcast includes packetized data.

47. A receiver as claimed in claim 26, further comprising at least one processor selected from the group consisting of an audio format processor and a video format processor.

48. A receiver as claimed in claim 26, further comprising a GPS receiver chip arranged to automatically update receiver geographic position so that when a broadcast of emergency or public service information is detected, regular operation of said receiver may be preempted if said receiver is within an area affected by said emergency or public service information.

49. A receiver for use in receiving C-band satellite broadcasts, comprising:

a small antenna providing nearly hemispherical coverage;

a low noise amplifier connected to amplify a signal received by the antenna;

a sync detection and demodulation unit connected to recover timing signals from an amplified signal output by the low noise amplifier; and

a plurality of receiver channel processors connected to the low noise amplifier and the sync detection and demodulation unit, each channel processor including a spread spectrum decoder, a demodulator, and an error correction unit, for recovering baseband signals,

wherein said antenna is a conformal retrodirective phased array antenna.

50. A receiver for use in receiving C-band satellite broadcasts, comprising:

a small antenna providing nearly hemispherical coverage;

a low noise amplifier connected to amplify a signal received by the antenna;

a sync detection and demodulation unit connected to recover timing signals from an amplified signal output by the low noise amplifier; and

a plurality of receiver channel processors connected

to the low noise amplifier and the sync detection and demodulation unit, each channel processor including a spread spectrum decoder, a demodulator, and an error correction unit, for recovering baseband signals,

wherein a first said receiver channel processor is used for a first primary data channel, a second said receiver channel processor is used for a second primary data channel, and a third said receiver channel processor is used for one of a time-delayed redundant signal and a signal received from a second satellite.

51. A receiver as claimed in claim 50, wherein at least one additional said receiver channel processor is used to process emergency or public service information.

52. A C-band broadcast signal consisting of a digital signal that has been encoded to provide Forward Error Correction, spread over a large frequency band, and used to modulate a satellite uplink carrier.

53. A C-band broadcast signal as claimed in claim 52, wherein the C-band broadcast signal is compressed by frequency domain transform coding, and the frequency domain transform coding is MPEG-4 with Advanced Audio Coding.

54. A C-band broadcast signal as claimed in claim 52, wherein said encoding for Forward Error Correction uses a Recursive Systematic Convolution Turbo Code.

55. A C-band broadcast signal as claimed in claim 54, wherein said encoding for Forward Error Correction is carried out at rate 1/4.

56. A C-band broadcast signal as claimed in claim 52, wherein said spreading is carried out using Direct Sequence Code Division Multiple Access encoding.

57. A C-band broadcast signal as claimed in claim 52, wherein said modulation is carried out by Phase Shift Keying.

58. A C-band broadcasting method comprising the step of using multi-channel receivers arranged to receive redundant signals, said redundant signals including one of a time-delayed redundant signal and a redundant signal received from a second satellite.